CRITICAL SUCCESS FACTORS FOR SUCCESSFUL IMPLEMENTATION OF INTERORGANIZATIONAL SYSTEM IN MANUFACTURING ORGANIZATIONS

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DEDICATION

…. to my beloved family

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ABSTRAK

Kajian ini bertujuan untuk membuat penyelidikan faktor kejayaan kritikal bagi implementasi sistem interorganisasi (IOS) di sektor perkilangan di Malaysia, terutamanya industri elektronik dan elektrikal. Model kajian ini mencadangkan tujuh faktor kritikal yang terdiri daripada tiga komponen (faktor organisasi, faktor innovasi teknologi dan faktor berkaitan sistem maklumat) yang akan mempengaruhi kejayaan implementasi IOS. Faktor keselamatan sistem maklumat dikaji dengan tujuh faktor kritikal ini untuk mengenalpasti kejayaan implementasi IOS. Kesan dan kepuasan pengguna merupakan aspek kejayaan implementasi IOS. Kajian ini telah mengenalpasti penglibatan pakar sistem maklumat adalah kritikal kepada aspek kesan kejayaan implementasi IOS. Berikutan, pelan dan visi perniagaan, keserasian, komunikasi dan pakar sistem maklumat adalah kritikal untuk pengenalan keselamatan sistem maklumat. Sebaliknya, keselamatan sistem maklumat adalah kritikal untuk pengenalan aspek kesan dalam kejayaan implementasi IOS. Akhirnya, pelan and visi perniagaan, keserasian dan infrastuktur sistem maklumat adalah kritikal kepada aspek kesan kejayaan implementasi IOS apabila menglibatkan faktor keselamatan sistem maklumat terperinci. Manakala infrastuktur sistem maklumat adalah kritikal untuk pengenalan kepada aspek kepuasan pengguna dalam menentukan kejayaan implementasi IOS apabila menglibatkan faktor keselamatan sistem maklumat terperinci.

ABSTRACT

This research attempts to study the critical success factors affecting Interorganizational System (IOS) implementation success in Malaysian manufacturing organization mainly electronic and electrical industry. The research model suggest that seven factors, comprising the organizational factors, technology innovation factors and information system related factors affect the implementation success of IOS. Information system security is used in order to understand the moderating effect on the above relationship. Impact and user satisfaction were used to judge whether an IOS implementation is a success or failure. This study concluded that in first model, information system expertise has significant effect on impact of IOS implementation. However, as for second model of IOS implementation success, of the seven CSF's, business plan and vision, compatibility, communication and information system expertise have significant effect on moderator variable which is system security. In the third model, system security has significant effect on impact of IOS implementation success compared to user satisfaction. Finally, in the fourth model, business plan and vision, compatibility and information system infrastructure have significant relationship on IOS implementation of impact dimension when system security is high. Information system infrastructure has significant relationship on IOS implementation of user satisfaction dimension when system security is high.

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Chapter 1

INTRODUCTION

1.1 Introduction

In today's business environment, most organizations are facing significant pressure to make their operational, tactical and strategic processes more efficient and effective. Information technology (IT) has become an attractive means of improving these processes. Consequently, organizations have implemented several strategies to improve effectiveness and to enhance efficiencies through the use of IT. Until recently, the main focus of many organizations was on improving internal operations. However, establishing strategic alliances between trading partners along the supply chain through the utilization of IT may result in great benefit. Electronic commerce (EC) is viable option in improving the supply chain in order to remain competitive. EC is the use of electronic means to exchange information and conduct business transactions within and across organizational boundaries. It allows organization to identify consumers; requirements and trends and subsequently communicate the gathered information throughout the supply chain quickly.

Supplier-buyer relationships have undergone radical changes in recent years. Organizations now realize that successful implementation of internal just-in-time (JIT) practices alone will have limited on improving the overall performance (Gavirneni, Kapuscinski and Tayur, 1999). Accordingly, organizations are beginning to emphasize closer supplier-buyer relationship in order to create more efficient operations. Such close relationships may offer technical, financial and strategic advantages over spot market transactions (Gulati, 1995 and Poon, 1999). Increased closeness in supplier-buyer relationships creates the basis for the simplest form of supply chain. According to Handfield and Nicholas (1999), "the supply chain

encompasses all activities associated with the (bi-directional) flow and transformation of goods from the raw materials stage (extraction), through to the end-user, as well as the associated information flows." The main objective of supply chain management is to unite trading partners along the supply chain into a seamless integrated flow of information and physical distribution.

Interorganizational system (IOS) provides organization with capabilities to improve linkages between trading partners along the supply chain. Electronic data interchange (hereafter EDI) is a traditional form of IOS. EDI allows electronic communication of business information with trading partners across a company's boarders: it permits organization to generate electronic purchase orders, invoices, bills of lading and variety of other documents and send them instantly to trading partners anywhere in the world. The reduction in communication, labor and material costs as well as the gain in competitive advantage is among the reported benefits of implementing an EDI environment (Hoogeweegen, Streng and Wagenaar, 1998).

1.2 History of IOS

The term IOS was coined in early 1980's, as Barrett and Konsynski (1982) used the term "interoganizational information sharing system" for the first time and Cash and Konsynski (1985) first coined the term "inter-organizational system" to refer to an automated information system shard by two or more organizations. An IOS is defined as a network-based information system that extends beyond traditional enterprise boundaries (Konsynski, 1993). With IOS permitting information access to other organizations, an organizational boundary is redefined and extended to the extend that a firm's value chain needs to be redesigned.

Today the information systems technology acts as an enabler of the transformation of organizations. In particular, the IOS is a category of information systems moving in this direction. Business organizations increasingly establish electronic links with their competitors or with firms in different industries to gain a competitive advantage. Information technology is now used to enable cooperation more than competition among firms. In this regard, Kumar and Van Dissel (1996) conceptualize IOS as planned and managed cooperatives ventures between otherwise independent agents. Today, IOS-enabled partnership and alliances among firms make is possible to seek business opportunities via new organizational and market relationships formed.

IOS exhibit unique characteristics that often act as incentives for IOS development. Bakos (1991) states that three characteristics are associated with IOS. First, an IOS decrease the costs of exchanging and acquiring information on the part of participating firms. Second, the benefits for the IOS innovator increase as the number of firms joining increases. Third, considerable switching costs incur as a result of shifting from one IOS to another.

1.3 IOS and Supply Chain Networks

When considering the effects of IOS operation performance, first we need to determine what performance priorities are associated with alternative operations and supply chain strategies. This becomes particularly relevant in light of research showing that companies operating in different types of supply chains may have different performance priorities (Lamming et al. 2000: Harland et al. 2001) and that the supply chain strategy must fit the specific needs of the company and its customers (Lee, 2005).

There has been a wealth of research over recent years to define taxonomies of supply chain networks and their relationships to performance. First, the studies distinguished between supply chain networks that were equivalent to the stable and dynamic configurations in Snow et al. (1992). Second, past researchers suggested that operations involved with different types of networks had different performance priorities

According to these studies, stable networks consist of routinized supply chains focused on building efficient and lean operations flows. Their operations are dedicated to functional products with long life cycles and a low degree of innovation, such as in stable consumer goods industries (Harland et al. 2001). Costs are determined by the degree of scale economies, capacity utilization and inventory turnover. Delivery involves performance in lead times and supply reliability. Quality may involve both conformance and performance issues; (Lamming, 2000) appeared to suggest that stable networks aimed at quality "sustainability" (conformance) levels, which might not be as high as the quality "supremacy"(performance) levels of dynamic networks. These networks aim at improving performance in costs, delivery and quality through eliminating non-value-added activities, producing high volumes of standardized products and optimizing information and material flows (Lee, 2005). Naylor (1999) and Huang (2002) particularly emphasized the need to eliminate waste and non-value-added activities to reduce cost and improve delivery across lean supply chains. Scale economies result from producing high volumes under stable demand conditions (Harland, 2001). In this context, information linkages are established to ensure, "….the most efficient, accurate and cost-effective transmission of information across the supply chain" (Lee, 2005).

Dynamic networks focus on agility and market-responsiveness. They enable the production of innovative products with short life cycles, such as in emergent industries with rapid technologies change (Harland et al. 2001). Therefore, their major performance priority is flexibility, followed by quality and delivery. Flexibility includes abilities in customizing products, changing the product mix and operating profitably in any volume of output (Huang, 2002). Delivery includes both reliability and lead-time performance. Quality performance (supremacy) appears to be more of a priority than in stable supply chain (Lamming, 2000). In dynamic networks, performance in flexibility, quality and delivery is achieved through adopting build-to-order and mass customization practices across the value chain, using information technology for speedy transfer of orders to factory or customization centre and developing agile processes to enable fast response to demand changes (Huang, 2002; Lee, 2005). In contrast to stable networks, which focus on inventory reduction through lean techniques, dynamic networks maximize delivery speed through building buffer stocks of raw materials, components, or products modules across the value chain (Huang, 2002). According to Lee (2005) the internet based system would provide the best channel to enable timely communication across the dynamic supply chain.

1.4 The Evolution of IOS

A number of researchers have developed various IOS framework. The evolution of IOS can be divided into two separate phases. The first phase is traditional IOS that use EDI (via Value-Added Networks (VAN) or traditional EDI for data interchange to support firms' value chains. The second phase if IOS that use XML,

workflow and other internet communication technologies for EDI to support partnering among organizations as well as firms' value chains.

Traditional EDI proved to be effective tool in the early years of IOS. Many studies have investigated the antecedents of EDI use and outcomes of EDI use (Hart and Saunders, 1998; Srinivasan, 1994; Ramayah et al. 2007). Others have focused on specific forms of relationships on the effect of IT and IIS (Bakos and Brynjolfsson, 1993; Clemons and Reddi, 1993; Gurbaxani and Whang, 1991; Holand and Lockett, 1997; Malone, 1987). Kumar (1998) presented a typology for IOS based on interorganizational interdependence. The characteristics of three types of IOS are pooled information resource IOS, value or supply chain IOS; and network IOS. Johnston and Vitale (1998) developed a classification framework using three dimensions: business purpose, relationship with participants and information function. The framework takes the form of a decision tree where the three dimensions are sequentially interconnected.

Although there are many competitive advantages of implementing traditional IOS, then why does not every organization implement traditional IOS? The primary reason is the high entry and running costs especially for small and medium size companies. To establish traditional EDI between both parties requires compatible hardware at both ends in order to have seamless processing (Clemons and Reddi, 1993). The additional costs associated with the VAN services typically fell in the range of USD5000-USD6000 per month (Bartholomew, 1997). The high costs of establishing VAN for EDI have hindered the growth of traditional IOS.

1.5 Internet-based EDI

The introduction of internet and web services has been changing electronic connections between firms. A major distinction between traditional EDI and internet-based EDI is their delivery platform and communication protocols: private VAN vs Internet VAN (Zhu, 2006). The cost of internet communication is significantly lower than of private VAN (Cai, 2006). Internet provides a low-cost alternative to private VAN for the data exchange. Increasingly, companies have or plan to implement internet-based IOS. Therefore, IOS research being migrated from traditional EDI to internet-based EDI.

Grossman (2004) defined internet-based EDI is shared by two or more organizations such as extranets, virtual corporation and business-to-business (B2B) electronic commerce. Internet-based EDI participants are not only buyers and sellers but also include affinity organizations or competitors. IOS supported the automation of manual processes, internet-based EDI enhance a range of new features for information sharing, communication and collaboration (Icasati-Johanson and Fleck, 2003). New interorganizational forms such as outsourcing, partnerships, strategic alliance and networked organizations are created between independent organizations in several industries (Ring and Van de Ven, 1994). Internet-based EDI tend to increase as the number of system participants grows. Electronic marketplace provides linkages between participants in horizontal and vertical linkages (Gurbaxani and Whang, 1991). The linkage between heterogeneous value chains is vertical, whereas the linkage between firms spanning a single industry is horizontal. Depending on the interaction patterns between the participants, internet-based EDI can be configured in three ways: one-to-one, one-to-many and many-to-many. With different system support levels (operational and strategic support) different organizations may

configure their internet-based IOS in different linkages and different ways. Internet-based EDI involve that all participating members coordinate their efforts and cooperate with each other (Lee, 2005)

For operational support level, internet-based EDI are primarily designed for supporting routine operations (Hong, 2002). Firms are connected to share their information as part of their day-to-day business to support a value or supply chain through the internet. For strategic support levels, internet-based EDI are designed to provide resource-oriented cooperation that includes exploitation of the economies of scale in operations and transaction costs (Gurbaxani and Whang, 1991).

Internet-based EDI may be classified into either electronic market or electronic hierarchy. Electronic market is designed to match buyers and sellers who generally do not share a long-term relationship. Under electronic hierarchy, the organizations involved share a long-term relationship and align their internal processes with one another (Lewis, 2001). Internet-based EDI change the structure of various industries and create competitive advantages and strategic necessity by giving companies new ways to cooperate with their supply chains.

1.6 IOS in Malaysia

For most Asian countries, EDI has been introduced in a big way only in the last five or six years. There are two prominent trends of VANs in these countries. In Asian countries, the Government usually plays a big role in the promotion and implementation of EDI. This is significantly different from the developments in the western countries, whereby the private sector impetus to EDI is very strong. This can be attributed to the fact that it has been recognized that EDI can be used as a springboard for a country's economic growth (Zainol, 2001). As EDI in Asian

countries is very much Government-led, there is a general trend towards the setting up of national VANs, in most cases with government participation, either directly or indirectly. This is evident in countries such as Malaysia, the Republic of Korea, Singapore and others. As international trade plays a key role in the economic development of the Asian countries, one can also observe that the first EDI application implemented in these countries is likely to be that in the international trade sector. Singapore implemented TradeNet as the first nationwide EDI application. Malaysia set off the EDI "fire" with DagangNet ("Dagang" in the Malay language translates to "trade").

Improvements made to the Customs Information System (CIS-Dagang*Net) including the introduction of new UN Directories for Electronic Data Interchange for Administration, Commerce and Transport (EDIFACT) messages such as SANCRT (International Movement of Goods Governmental Regulatory Message) and multiple Electronic Fund Transfer (EFT) such as PAYMUL (Multiple Payment Order Message), DEBMUL (Multiple Debit Advise Message) and CREMUL (Multiple Credit Advise Message) which were implemented in the free zone seaports and airports. The government has agreed that the Malaysian Customs Department also develop a web-based Customs Portal, to give users the choice of two electronic means to access the Customs Information System either through the Customs Portal or through the existing EDI system. The EDI system is being progressively implemented in 26 permit issuing Government agencies (Seetharaman, 2006).

Malaysia started the implementation of automated clearance in 1994 in Port Klang and in 1996 in the Subang Airport as pilot projects. The system is known as EDI Malaysia – (EDIm) and is developed by the Malaysian private company DagangNet (Zainol, 2001). The objective of the project was to link the port (sea ports

and airports) to the customs authorities and to complete progressively the information flow by linking the importers, customs agents and banks. However, the Asian crisis in the mid-1997 put the development of the system on low priority.

With the post-crisis recovery and progressive increase of international trade, new emphasis was put on electronic clearance system development. In 2001, a system of electronic permits was introduced. The system allows importers and exporters to submit permit applications electronically to the specific government agencies involved in import and export procedures. The approved application should be automatically routed to customs for their acknowledgement and their response is electronically sent to the importer or exporter.

The entire process is designed to be completed through Internet or the private DagangNet connection. The governmental agencies involved in this project are Department of Veterinary Services, Malaysian Timber Industry Board, Ministry of International Trade and Industry, National Forest and Wildlife Protection Department. The final objective is the creation of standardised e-document, which can be routed to all relevant parties without need for duplication. However, the electronic permit system is not completely operational due to technical problems and to the non-participation of some other government authorities, which are involved in import-export procedure.

The system is also designed to use e-documents such as e-import and export declaration, and electronic manifest. The use of EDI by the small and medium sized companies was promoted by setting the EDI shops. Small companies can use these shops to accomplish their import/export formalities. Despite the relatively fast development of the EDI, the existing system still faces several major challenges:

- co-existence of automated and manual procedure in the electronic clearance implementation
- lack of interface with certain governmental authorities responsible for import/ export procedures
- low involvement of the banking sector in the system
- co-existence of different automated systems in particular ports and airports, which renders the implementation of a country-wide EDI system rather difficult (Ahmad and Schroeder, 2001).

The private operators pointed out the elimination of these difficulties and complete implementations of the system were major priority for trade facilitation. The key issues identified by the Malaysian freight forwarders were related to the lack of complete implementation of the EDI clearance for imports. Whereas the export clearance is paperless, the clearance of imports still involves manual operations. To date, only customs declarations are done electronically and the remainder transactions are all done manually. This system is not cost-effective for the freight forwarders as it involves double task and further slows down the process of customs clearance.

The current system functions as follows: the importer enters all the details of the shipment electronically and fills in the import declaration. The customs attribute a number to the declaration and return it to the importer. The importer prints it out and brings it manually to the customs together with the other import documents. The custom officer examines the documents and decides whether the shipment will be submitted to physical or documentary verification. The average duration of customs clearance in Malaysia is currently estimated to be between 24 and 72 hours.

Moreover, the operators estimate that the current combination of EDI and manual clearance further complicates transhipment given the fact that similar procedure is followed for transhipment cargo.

Another area of concern is the functioning of electronic fund transfer (EFT) during the electronic clearance. According to the DagangNet, the use of EFT is not possible given the fact that the banks can not ensure 24 hours service and that they prefer to use their own fund transfer system. According to operators, the absence and delays of EFT further slow down clearance.

The absence of interface with other agencies involved in import/export procedures and the customs also delays the clearance process. The forwarder or the importer should first apply for other necessary authorisations, obtain them in paper version and process the customs clearance afterwards. Full implementation of electronic permits system and participation of all involved authorities will remove this procedure (Seetharaman, 2006).

The absence of EDI in a number of ports and airports represents an additional difficulty. The different level of implementation in different ports and airports and the lack of training further hamper the implementation of automated clearance. According to certain operators, containers are missing from the EDI due either to human or system errors. Moreover, the customs should be able to interface other electronic systems such as Malaysian Food Information System or e-logistic systems for cargo tracking in port and airports.

Nevertheless, some operators consider that the system is not user-friendly and should be significantly improved to meet the expectations of the small and medium-sized companies. The customs have installed in the major ports and airports, so-called

“e-shops”, where small companies can fill-in their customs declarations. However, the e-shops seem to be under-used.

Operators have also underlined that despite the relatively early implementation of the EDI in Malaysia (1994 in port Klang and 1996 in Kuala Lumpur International Airport), the re-engineering of the system is still on-going and the break-downs are quite frequent (Zainol, 2001). The operators are informed by SMS about the break-downs of the system and in meantime they have to go through standard paper-based clearance. The upgrading of the system might be necessary to meet increasing requirements of international trade. The absence of implementation of total supply chain management through EDI has several consequences:

- delays customs clearance of imports and exports,
- delays transhipment,
- affects competitiveness of the Malaysian ports and airports as important hubs in the region.

The absence of total automation delays customs clearance and doubles the work of freight forwarders and importers. When fully operational, the clearance system will allow reducing time to handle cargo documentation to five minutes from up to six hours currently. In addition, the involvement of only five out of twenty five other governmental agencies responsible for import-export transactions causes further delays. These delays could be important in comparison with the duration of customs clearance in Singapore which can be less than 1 hour.

The efficiency and security of transaction is important for business. This can explain why several companies prefer Singapore to Malaysian ports. The transhipment business is also delayed given the fact that a formal import document should be filled in for transhipment cargo. In addition, a fully automated procedure

will speed up transhipment and will render Malaysia more attractive destination for transhipment cargo.

The delays in cargo movement affect the competitiveness of Malaysian ports and airports compared to Singapore as well as to other up-coming regional hubs as Taiwan and Vietnam. It is important to notice that part of the Malaysian cargo is still going to Singapore despite the fact that the costs are higher.

In order to attract all the indigene cargo, Malaysia needs first to attract more international carriers, and by doing so, to secure frequent sea and air connections to its major export markets. Increase in import, export and transhipment will encourage shipping and air companies to make more direct calls from and to Malaysia. The current delays in export, import and transhipment procedures impede the hub development. Moreover, this obliges national and foreign exporters or suppliers to search for other options for their shipment and transhipment activities due to time constraints.

The increase of efficiency of all services and especially the introduction of seamless procedure is the only way to sustain the Malaysian competitiveness as regional hub.

1.7 Research Problem

Malaysia's top five trading partners were the United States of America, the Republic of Singapore, the European Union, Japan and the People's Republic of China. These countries contributed 60.7% to Malaysia's total trade during January - October 2007 as stated in the official website of Malaysian statistics agency.

Also a total of 61 industries (57.5%) out of 106 industries covered in the Department of Statistics, Malaysia website has recorded a sales value of RM1 billion

and above for the period January-October, 2007. These industries registered a cumulative sales value of RM407.3 billion, which was 0.5% or RM2.1 billion higher than RM405.2 billion reported a year ago. The sales value of these 61 industries represented 95.2% of the total sales value reported in the manufacturing sector.

The achievement of the process requires the implementation of IOS for advance classification and unique consignment code system. This will allow Malaysia to achieve best world standards in this field and to attract more transhipment traffic. In addition, it will also attract more foreign-based companies to be set up in Malaysia. This will further boost Malaysia economic growth and promote job opportunity. According to Malaysia Economic Indicators (2007**),** the Coincident Index (CI) grew 0.2% from 122.5 points in June to 122.7 points in July 2007. Salaries and wages in manufacturing sector (0.2%), sales in manufacturing sector (0.2%) and gross imports (0.1%) posted positive percentage change. The six-month smoothed growth rate recorded 3.7% in the current month.

The six-month smoothed growth rate of Leading Index (LI) maintained a favorable growth at 8.8% in July 2007. Four out of eight LI components recorded increases, namely, housing permits approved (0.9%), money supply, M1 (0.6%), numbers of new companies registered (0.2%) and total traded with eight major trading partners (0.1%). The LI rose by 0.9% to register 153.0 points in the current month.

The Lagging Index (LGI) recorded an increase of 4.0% to reach 155.3 points in July 2007. Positive contribution to the index were registered by real excess lending to private sector (3.4%), number of EPF defaulters (0.6%) and number of new vehicles registered (0.3%) . The six-month smoothed growth rate surged to 15.0% in the current month. It is expected that the economic growth to continue expanding in

the first quarter of 2008 as reflected by the 8.8% of the LI's six-month smoothed growth rate.

The development of manufacturing sector in Malaysia has highlighted the necessity to develop enhanced IOS for supply chain management. The integration of e-customs and e-logistic will give higher value added to trade community members. This will allow sharing and reusing of information (vessel manifest, purchasing orders, invoice and packing lists), real-time alert system and seamless process for imports and exports.

Past studies have shown or highlight us, many firms focusing on IOS mainly to support operational activity and several frameworks to identify system planning in an organization to further improve operation performance. For almost four decades, supply transaction were conducted face-to-face channels or through EDI (Walton and Gupta, 1999; Frohlich, 2002). EDI was preferred channel for large organization that could afford investment in dedicated VAN to build long-term relationship between buyer-supplier (Larson and Kulchitsky, 2000). In all remaining circumstances, firms have on rely on face-to-face channels till today which will increase cost, time and errors in purchasing (Kock, 2000). The advent of internet B2B applications created a range of new opportunities for managing buyer-supplier relationship. It allowed firms to set up extranet system, carry out electronic purchasing transaction. Widespread, low-cost access to electronic markets facilitated supplier selection and contracting, simultaneously reducing production and coordination cost (Clemons and Row, 1992; Baron, 2000).

Despite the growing use of IOS in buyer-supplier coordination, it is very important to understand what is needed to ensure a successful IOS implementation. Further, there are limited empirical studies that have been conducted to assess the

critical success factors for successful implementation of IOS in Malaysian manufacturing organization. Hence, it is important to examine how we can avoid costly mistakes during implementation.

1.8 Research Objectives

Giovani and Rafaella, (2006) stated that given the complexity and complication of the problems to low success rate of IOS implementation, adopters could not simply choose critical success factors from the West and implement them in a country. Therefore, the primary purpose of this research is to identify what are the critical success factors (CSF) for successful IOS implementation in a manufacturing organization and also the moderating effect of information system security. Other research objectives were to determine the percentage of IOS implementation delays, to estimate amount of loss and duration delayed, and finally to determine the perceived benefits prior to IOS implementation in Malaysian manufacturing organizations.

1.9 Research Questions

In seeking to achieve the above objectives, this study is actually examining the individual critical success factors (CSF) such as business plan and vision, change readiness, compatibility, user training and education, communication, information system expertise and information system infrastructure in an attempt to answer the following research questions:

1. What is the percentage of IOS implementation delays in Malaysian manufacturing organizations?

2. What was the estimated amount of loss and duration delayed caused by IOS implementation failures in Malaysian manufacturing organization?
3. What are the IOS implementation benefits in Malaysian manufacturing organizations?
4. What are the CSF's for successful implementation of IOS in a manufacturing organization?
5. Information system (IS) security moderates the relationship between CSF's and successful IOS implementation in Malaysian manufacturing organization?

1.10 Significance of the Study

This study is expected to facilitate the academicians and practitioners to enhance their research or to practice IOS in their organization. On top of that, this study may institute a base of success factors to implement and sustain IOS in manufacturing organization for operation excellence. It may highlight the key factors, which are essential to the management and the organization to implement IOS successfully.

The main contribution of IOS in operation management is providing support to supplier coordination. (Benjamin and Wigand, 1995; Kumar and Van Dissel, 1996). The ability to exchange information at low cost has been considered one of the major determinants of success in buyer-supplier relationship. (Helper, 1991; Hill and Scudder, 2002). Effective IOS allow rich information exchange, quick and reliable availability of data and easy access to business partners (Mukhopadhyay, 1995). From a transaction cost perspective, their adoption may simultaneously reduce coordination costs and transaction risk. (Clemons and Row, 1992).

On top of it, this study is very much significant in the Malaysian context. It has been a motivation for this study to be carried out until now. Research has not been done to analyze the relation between our Malaysian cultures with the internationally recognized IOS implementation. IOS is rarely been implemented by organization as it requires coordination and initiative between buyer-supplier to practice the tool effectively and efficiently. In Malaysia, IOS is been practiced by the multinational companies, as they were imposed with IOS earlier from their parent company mainly from West and China.

1.11 Definition of Key Terms

In order to share common understanding of the concepts and for better understanding of further discussion, the following key terms' definition were referred specifically.

1) Interorganization Information System (IOS)

An interorganizational information system is one which allows the flow of information to be automated between organizations in order to reach a desired supply-chain management system, which enables the development of competitive organizations. This supports forecasting client needs and the delivery of products and services. IIS helps to better manage buyer-supplier relationships by encompassing the full depths of tasks associated with business processes company-wide. In doing these activities, an organization is able to increase the productivity automatically; therefore, optimizing communication within all levels of an organization as well as between the organization and the supplier (Choudhury, 1997; Hart and Saunders, 1997; Kumar and Van Dissel, 1996).

2) Electronic Data Interchange (EDI)

Set of standards for structuring information that is to be electronically exchanged between and within businesses, organizations, government entities and other groups. The standards describe structures that emulate documents, for example purchase orders to automate purchasing. The term EDI is also used to refer to the implementation and operation of systems and processes for creating, transmitting, and receiving EDI documents (Hart and Saunders, 1998; Marcussen, 1996).

3) Internet-based EDI

Defined as internet-based information system shared by two or more organization, such as extranets, virtual corporation, internet-based electronic data interchange (EDI), business-to-business electronic commerce (B2B e-commerce) (Grossman, 2004). A major distinction between traditional EDI and internet-based EDI is their delivery platform and communication protocols; private VAN vs Internet VAN (Zhu, 2006). The cost of internet communication is significantly lower than that of private VAN (Cai, 2006).

4) Information technology (IT)

The study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware. In short, IT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit and retrieve information, securely (Webster, Frank and Robins, Kevin, 1986).

5) Information System (IS)

An information system consists of three components: human, technology, organization. In this view, information is defined in terms of the three levels of semiotics. Data which can be automatically processed by the application system corresponds to the syntax-level. In the context of an individual who interprets the data they become information, which correspond to the semantic-level. Information becomes knowledge when an individual knows (understands) and evaluates the information (e.g., for a specific task). This corresponds to the pragmatic-level. (Langefors, 1973).

6) Operation excellence

Is a goal of conducting business in a manner that improves quality, obtains higher yields, faster throughput, and less waste. Also sometimes known as OpX, operational excellence is the state or condition of superiority in operations and execution of business processes (Malone et al. 1987; Choudhury, 1997; Holland and Lockett, 1997).

7) Customs Information System

The Customs Information system was established under the CIS Convention of 1995. Its aim is to assist in combating customs related crime by facilitating co-operation between European customs authorities. This is a development of the principles of the 1967 Naples Convention which dealt with mutual assistance between Customs administration in Member States and which Ireland ratified when it acceded to the EEC in 1973. The abolition of border controls following the formation of the Single

Market in 1993 was a motivating factor in developing CIS as a means to combat smuggling (Data Protection Commissioner).

8) Electronic Fund Transfer

Electronic Funds Transfer (EFT) is a system of transferring money from one bank account directly to another without any paper money changing hands. One of the most widely-used EFT programs is Direct Deposit, in which payroll is deposited straight into an employee's bank account, although EFT refers to any transfer of funds initiated through an electronic terminal, including credit card, ATM, Fedwire and point-of-sale (POS) transactions. It is used for both credit transfers, such as payroll payments, and for debit transfers, such as mortgage payments (Leow, Hock Bee, 1999).

1.12 Organization of the Remaining Chapters

This report is organized into five chapters. Chapter 1 provides an overview of an IOS, benefits, success and failure stories, importance of the research for Malaysian manufacturing organizations, research problem, research objective, research questions and significance of the study. Chapter 2 presents the literature on critical success factors, IS security, IOS successful implementation and the development of theoretical framework. Chapter 3 discusses the research methodology used in this research. Chapter 4 details the statistical analyses and hypotheses testing. The survey findings are then concluded in Chapter 5, with a discussion of the findings and limitation of the study.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

The core of the chapter is to intricate the success factors that were identified during pilot survey, as being critical to successful implementation of IOS. Critical success criteria of IOS implementation will be discussed in detail.

2.2 Critical Success Factors Characteristics

A list of 18 CSF's were compiled from the past research done by Lee and Kim (2007), Giovani and Raffaella (2006), Afzaal, Mohd Noah and Hj Awg Yussof (2007), Mazen Ali, Sherah and Robert (2008), Yuliang, Jonathan and Martin (2007) and among others. Table 2.1 summarizes the CSF's for the study.

Table 2.1
Critical Success Factors

Critical success factors (CFS)	Rank 1	Rank 2	Rank 3
Business plan and vision	***9***	**1**	**0**
Enternal and competitive influence	**0**	**0**	**0**
Change readiness	***7***	**1**	**2**
Clear goals and objectives	**0**	**0**	**0**
Communication	**3**	***5***	**2**
Compatibility	**3**	***6***	**1**
Network realibity	**0**	**0**	**0**
Information system expertise	**3**	**1**	***6***
Information system infrastructure	**2**	**2**	***6***
Organizational Trust between partners	**0**	**0**	**0**
Partnership with vendor	**0**	**0**	**0**
Cost	**0**	**0**	**0**
Industry segment	**0**	**0**	**0**

Teamwork & Composition	**0**	**0**	**0**
Business process re-engineering	**0**	**0**	**0**
Use of consultants	**0**	**0**	**0**
User training and Education	**2**	***6***	**2**
Government support	**0**	**0**	**0**

Ten procurement managers from three manufacturing organizations in Penang, Malaysia were requested to rate this list. Result of the survey can be found in the Table 2.1, with the top 7 CSF's italicized. From the pilot study, theoretical framework has emerged with three main clusters for independent variable. First, business plans and vision and change readiness were clustered as organizational factors. Second, compatibility and user training and education and communication were clustered as technology innovation factors. Third, information system expertise and information system infrastructure were clustered as information system related factors.

2.2.1 Business Plan and Vision

Interorganizational system such as EDI involve substantial internal effort for development and have significant impact on the organizations, many organizational factors such as business plan and vision can be expected to influence the decision to adopt these strategic systems (Premkumar and Ramamurthy, 1995). Planning a sophisticated IOS should not be taken lightly or with little forethought. As mentioned before, there are enormous potential costs associated with such as undertaking. Planning should be closely identified with maintaining scope during an implementation. Cost overruns and development delays are costly, sometimes fatal results of ineffective planning (Lee et al. 2007). A clear business plan and vision to steer the direction of the IOS implementation is needed throughout. Lee et al. (2007) stated that business model of how the organization should operate behind the